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North Carolina Department of Transportation
Planning and Research Branch
Thoroughfare Planning

Dare County Thoroughfare Plan

July, 1988

THOROUGHFARE PLAN

FOR

DARE COUNTY, NORTH CAROLINA

Prepared by the:
Thoroughfare Planning Unit
Statewide Planning Group
Planning and Research Branch
Division of Highways
North Carolina Department of Transportation

In Cooperation with:
The County Of Dare
The Federal Highway Administration
U.S. Department of Transportation

July, 1988

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I. INTRODUCTION

The economic development of a region can be greatly influenced by how efficiently the transportation system handles travel demand. If the system fails to provide the means for quick and convenient transportation of people and goods, the region's economic growth becomes stagnated and fails to reach its potential. It is necessary that such a system not only meet existing travel demands, but also that it keep pace with the development of the region. This report will set forth a system of thoroughfares to satisfy the anticipated traffic and land development needs of Dare County for the next twenty years. In the development of the system of thoroughfares, certain priorities shall be established based on maintenance needs, inadequate bridges, poor horizontal and vertical alignment, and insufficient present and future capacity.

The system of thoroughfares proposed was developed following the basic principles of thoroughfare planning as described in Chapter II of this report. Major thoroughfares were located based upon existing and anticipated travel demands, existing streets, existing and anticipated land developments, topographic conditions, and field analyses. The plan advocates those improvements which are felt to be essential for proper traffic circulation within the current planning period (1988-2010).

Some of the proposed improvements in the county plan will be primarily the responsibility of the North Carolina Department of Transportation. However, Dare County can provide assistance in the implementation of the plan through subdivision regulations and zoning ordinances. With the different governmental agencies involved in developing the thoroughfare system, coordination of activities is of prime importance. Thus, it will be desirable for the plan to be formally adopted by both the County Commissioners and the North Carolina Board of Transportation to serve as a mutual official guide in providing a well coordinated, adequate, and economical major street system.

II. COUNTY THOROUGHFARE PLANNING PRINCIPLES

Purpose of Planning

There are many benefits to be gained from thoroughfare planning, but the main objective is to assure that the road system will be progressively developed in a manner that will adequately serve future travel desires. Thus, the essential concept of thoroughfare planning is to make provisions for street and highway improvements so that when needs arise, feasible opportunities to make improvements exist.

Streets, roads, and highways, accomplish two primary functions. They provide traffic service and land service. When combined, these two uses are basically incompatible. This conflict is not serious if both traffic and land service demands are low. When traffic volumes are high, however, access conflicts created by uncontrolled and intensively used abutting property result in intolerable traffic flow friction and congestion.

The major benefits derived from thoroughfare planning are: (1) Each road or highway can be designed to perform a specific function and to provide a specific level of service. This permits savings in rights-of-way, construction, and maintenance costs; protects residential neighborhoods, and encourages stability in travel and land use patterns. (2) Local officials are informed of future improvements. Developers can design subdivisions to function in a non-conflicting manner. School and park officials can better locate their facilities. Damage to property values and community appearance that is sometimes associated with road improvements can be minimized.

County Thoroughfare Planning Concept

The underlying concept of the thoroughfare plan is that it provides a functional system of streets, roads and highways which permit travel from origins to destinations with directness, ease and safety. Different elements in the system are designed and called on to perform specific functions and levels of service, thus minimizing the traffic and land service conflict.

Within the county plan, elements are considered to be either urban or rural. Inside the urban planning area, the local municipality generally has planning jurisdiction. Outside the urban planning area, the county has planning jurisdiction. In those urban areas where no urban thoroughfare plan has been developed, elements are generally considered to be rural and under the planning jurisdiction of the county. When a thoroughfare plan is developed for an urban area that has not previously had a plan, then the area defined by that plan would be considered urban and come under the planning jurisdiction of the municipality.

Within the urban and rural systems, thoroughfare plan elements are classified according to the specific function which they are to perform. A discussion of the elements and functions of the two systems follows.

Urban Thoroughfare Classification System

In the urban thoroughfare plan, elements are classified as either local access streets, minor thoroughfares or major thoroughfares. Local access streets which may be further classified as residential, commercial, or industrial streets are designed only to provide access to abutting property. Minor thoroughfares are more important streets in the urban system and are designed to collect traffic from local access streets and carry it to the major thoroughfare system. They may also serve abutting property and serve some minor through traffic movements. The major thoroughfares are the primary traffic arteries of the urban area providing for traffic movements within, around, and through the area.

Due to the limited amount of detail that can be shown on a county thoroughfare plan, only urban major thoroughfares are shown. A coordinated system of major thoroughfares which is most adaptable to desire lines of travel within an urban area and reflected in most urban area thoroughfare plans is the radial-loop system. The radial-loop system includes radials, crosstowns, loops, and bypasses. Radial thoroughfares provide for travel from points outside to major destinations inside the urban area. Crosstowns thoroughfares provide for traffic movements across the central area and around the central business area (CBD). Loop thoroughfares provide for lateral travel movements between suburban areas. Bypasses are designed to carry non local traffic around or through the area. Occasionally a bypass with low through traffic volumes can be designed to function as a portion of an urban loop. The radial-loop major thoroughfare system concept and concept of functionally classified urban street system are illustrated in Figure 1.

Rural Thoroughfare Classification System

The rural system consists of those facilities outside the urban thoroughfare planning area boundaries. They are classified into four major systems: principal arterials, minor arterials, major and minor collector roads, and local roads. Table 1 indicates generally accepted statewide mileage on these systems.

FIGURE 1

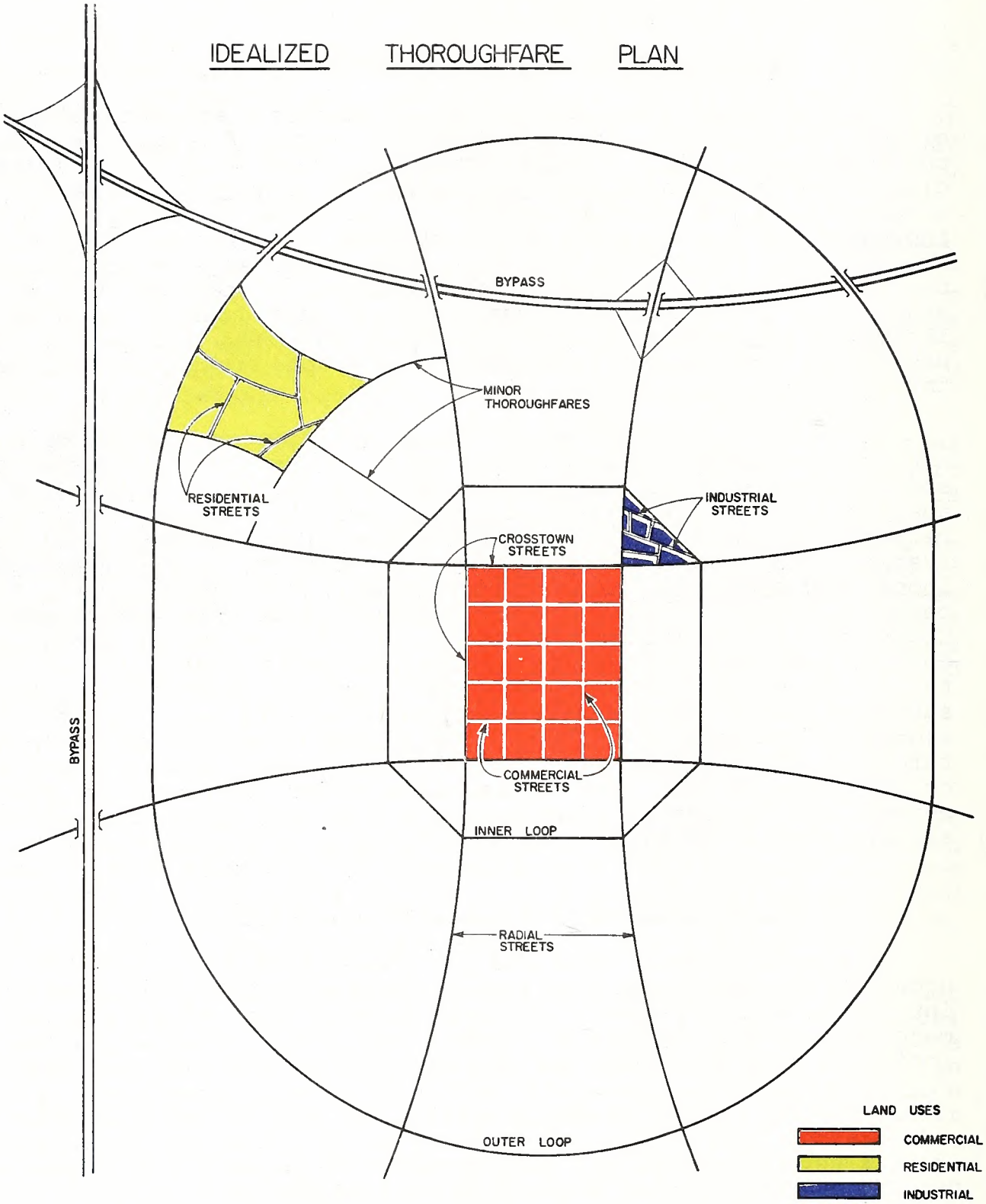

IDEALIZED THOROUGHFARE PLAN
BYPASS
MINOR THOROUGHFARES
RESIDENTIAL STREETS
INDUSTRIAL STREETS
CROSSTOWN STREETS
BYPASS
COMMERCIAL STREETS
INNER LOOP
RADIAL STREETS
OUTER LOOP
LAND USES
COMMERCIAL
RESIDENTIAL
INDUSTRIAL

TABLE 1

Rural System Road Mileage Distribution

Systems	Percentage of Total Rural Miles
Principal arterial system	2-4
Principal arterial system plus minor arterial road system	6-12
Collector (Major plus minor) road system	20-25
Local road system	65-75

Figure 2 gives a schematic illustration of a functionally classified rural highway system.

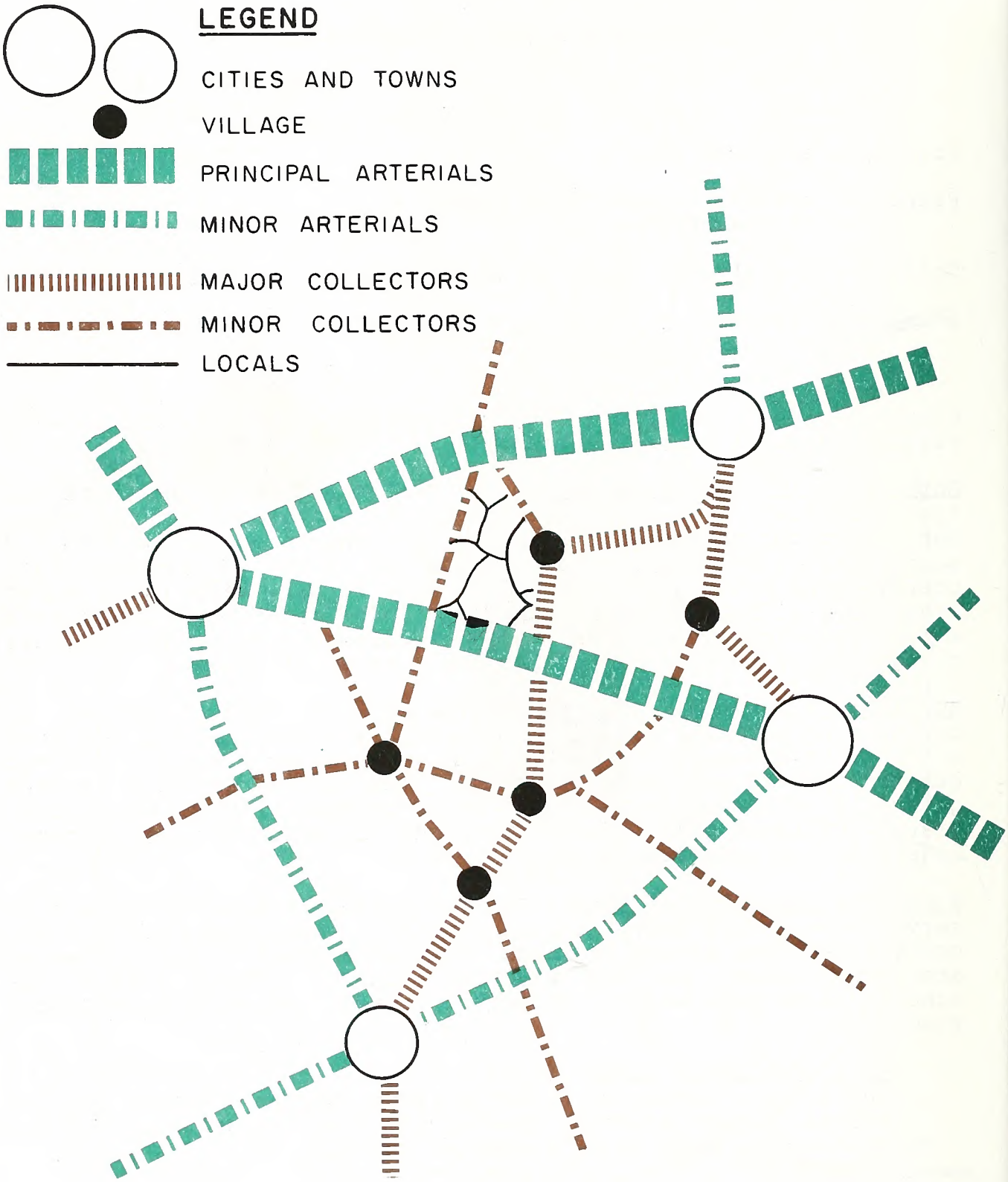
Rural Principal Arterial System : The rural principal arterial system consists of a connected network of continuous routes which serve corridor movements having trip lengths and travel density characteristics indicative of substantial statewide or interstate travel. The principal arterial system should serve all urban areas of over 50,000 population and a large majority of those with a population greater than 5000. The Interstate system constitutes a significant portion of the principal arterial system.

Rural Minor Arterial System : The minor arterial system in conjunction with the principal arterial system forms a network which links cities, larger towns, and other major traffic generators such as large resorts. The minor arterial system generally serves interstate and inter-county travel and serves travel corridors with trip lengths and travel densities somewhat less than the principal arterial system.

Rural Collector Road System : The rural collector routes generally serve intra-county travel rather than statewide travel and constitute those routes on which the predominant travel distances are shorter than on the arterial routes. This system is subclassified into major collector roads and minor collector roads.

> Major Collector Roads: These routes (1) provide service to the larger towns not directly served by the higher systems and to other traffic generators of equivalent intra-county importance, such as consolidated schools,

FIGURE 2



SCHEMATIC ILLUSTRATION
OF FUNCTIONALLY CLASSIFIED
RURAL HIGHWAY NETWORK

shipping points, county parks, important mining and agricultural areas, etc., (2) link these places with nearby larger towns or cities, or with routes of higher classification; and (3) serve the more important intra-county travel corridors.

Minor Collector Roads : These routes (1) collect traffic from local roads and bring all developed areas within a reasonable distance of a collector road; (2) provide service to the remaining smaller communities; and (3) link the locally important traffic generators with their rural hinterland.

Rural local Road System : The local roads comprise all roads not on one of the higher systems. Local residential subdivision streets and residential collector streets are elements of the local road system. Local residential streets are either cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than one mile in length that do not connect thoroughfares or serve major traffic generators and do not collect traffic from more than one hundred dwelling units. Residential collector streets are streets which serve as the connecting street system between local residential streets and the thoroughfare system.

III. DARE COUNTY-POPULATION, LAND USE, AND TRAFFIC

Dare County is the most eastern coastal county in North Carolina, as shown in Figure 3. Surrounded by water except on it's western boundary where it is bordered by Tyrrell and Hyde Counties. Currituck County is at it's northern border on the Outer Banks and connected to the Currituck mainland by way of the Wright Memorial Bridge. It was named for Virginia Dare, born August 18, 1587, on Roanoke Island in the county, who was the first child of English parents to be born in America. Major Highways in Dare County are US 64, US 264, US 158, NC 12, and NC 345. Connections to the Roanoke Island and the Outer Banks are by way of Lindsey B. Warren Bridge, William B. Umstead Bridge, Washington Baum Bridge, and the Oregon Inlet Bridge. To exit the county from the south, a state operated ferry travels the Hatteras Inlet from Hatteras to Ocracoke Island.

Air service in the county, for small craft, is provided by the general aviation charter air services at the Dare County Regional Airport, First Flight Airport, and the Billy Mitchell Airport.

Factors Affecting Transportation

The objective of thoroughfare planning is to develop a system of transport which will enable people and goods to travel safely and economically. To determine the needs of a county, the factors of population, land use, and traffic must be examined. To properly plan for the transportation needs of a county, it is important to understand and describe the type and amount of travel which takes place in that area, and also to clearly identify the goals and objectives to be met by the thoroughfare plan.

In order to accomplish the objectives of an adequate 20-year thoroughfare plan, responsible forecasts of future travel characteristics must be achieved. Such forecasts are possible only when the following major items are carefully analyzed: (1) historic and potential population changes; (2) notable trends in the economy; (3) character and intensity of land development; and (4) motor vehicle registration and usage. Additional items that vary in influence include the effects of legal controls such as zoning ordinances and subdivision regulations, availability of public utilities and transportation facilities, and topographic and other physical features of the area.

GEOGRAPHIC LOCATION

DARE COUNTY

DARE COUNTY WAS FORMED IN 1870 FROM CURRITUCK, TYRRELL, AND HYDE COUNTIES. LOCATED IN THE NORTHEAST SECTION OF THE STATE, IT IS BOUNDED BY THE ATLANTIC OCEAN; PAMLICO, CROATAN, AND ALBEMARLE SOUNDS; AND HYDE AND TYRRELL COUNTIES. IT WAS NAMED FOR VIRGINIA DARE, BORN AUGUST 18, 1587, ON ROANOKE ISLAND IN THE COUNTY, WHO WAS THE FIRST CHILD OF ENGLISH PARENTS TO BE BORN IN AMERICA.

FIGURE 3

Population Trends

The magnitude of traffic on a section of roadway is a function of the size and location of the population it serves. An analysis of the population is one of the first steps for transportation planners. The analysis of past trends allows the planner to estimate future population and traffic which it will create with some degree of reliability.

From 1940 to 1950, there was a decrease in population of 10.5 percent. A moderate increase of 9.8 and 17.9 percent occurred during the years from 1950 to 1960 and from 1960 to 1970. As shown in Table 2, the increase in population from 1970 to 1980 of 6382 represents a 91.2 percent increase in population. Based on N.C. Department of Administration projections, the county can anticipate continued rapid population increases during the 20-year planning period. The 20 years from 1980 to 2000 indicates another tremendous growth period for the county - a 47.3 percent increase from 1980 to 1990 and a 55.7 percent increase from 1990 to 2000. From the years 2000 to 2010, projections taper off to a 29 percent growth increase.

TABLE 2

HISTORICAL AND PROJECTED POPULATION
TRENDS FOR DARE COUNTY

YEAR	POPULATION	CHANGE	% CHANGE
1950	5,405	- 636	- 10.5
1960	5,935	+ 530	+ 9.8
1970	6,995	+ 1,060	+ 17.9
1980	13,377	+ 6,382	+ 91.2
1990	22,501	+ 9,124	+ 68.2
2000	31,850	+ 9,349	+ 41.5
2010	41,383	+ 9,533	+ 29.9

Source: United States Census
(Projections taken from Office of State Budget and Management, State of North Carolina, April 1988)

According to the United States Census Bureau, 1980, the population growth rate compared to other counties indicated that Dare County is the fastest growing county in the state. Neighboring Currituck County is the second fastest growing county.

The Dare County Carrying Capacity / Development Study prepared by Booz, Allen, and Hamilton, Inc. gives a detailed analysis of population growth and physical development into three scenarios. Scenario I is based on the lowest rate of increase that

would probably result in an initial surge of development with low continuous growth rates. Scenario II anticipates a steady, moderate rate of development through the year 2000. Projections indicate that there would be room for development after the year 2000. Scenario III begins with development at a modest rate somewhat higher than Scenario II for the first five years. Development momentum is expected to pick up thereafter and to close with a rush in the last four years. Under Scenario III, the county would be at close to build-out by the year 2000.

In an effort to generate seasonal population data, Socio-economic data of the municipalities of Nags Head, Kill Devil Hills, Kitty Hawk, Southern Shores, Duck, and Colington will be collected beginning the summer of 1988. The end result will be a transportation study for urbanized areas of Dare County. The town of Manteo will not be included since a recent transportation plan was completed. This socio-economic data will be used to analyze and project future travel patterns of the area and to establish a more precise seasonal population data. This data will illustrate to what effect seasonal population impacts have on county facilities.

LAND USE

The generation of traffic on a particular street is very closely related to the utilization of adjacent land areas. Some type of land uses create much more traffic than others. For example, a commercial or retail area such as a shopping center would generate (or attract) much larger volumes of traffic than a residential area. The attraction between different land uses varies with the intensity of development and the distance between those developed areas. It, thus, becomes necessary to designate land uses by type for the purposes of transportation planning. An analysis of the distribution of existing land uses serves as a basis for forecasting future land use needs and the resulting travel patterns. Based on 1986 population data found in the publication, Profiles: North Carolina Counties, Dare county had a density of 41.9 persons per square mile. Large tracts account for the majority of land acreage with most of the residential, commercial, and institutional uses located along the county's major and minor thoroughfares. Motels, summer homes, townhouses, and condominiums have sprung up rapidly since 1980 and continue to grow as evidence by the subdivision plats and building permits issued by the county administration offices. Areas along the US 158 corridor which connects Dare County and the Outer Banks area with Currituck County and the Norfolk, Virginia area serves as the primary approach route for tourist / visitor traffic which peaks during the summer months. US 158 (previous years designated as a bypass, but recently dropped in 1987) passes through Kitty Hawk, Kill Devil Hills, and Nags Head is a suburban arterial roadway serving through traffic and providing local access to adjacent development. NC 12 (Beach Road) provides north-south travel along the beach and serves primarily as a local access road. However, in the northern and southern portions of the county, it also serves as an arterial roadway since it is the only through road. Due to

the paving of NC 12 north, in 1984 from the Dare County line to Corolla, communities along the Outer Banks such as Southern Shores, Duck, Sanderling, and other communities north in Currituck County have and still are experiencing tremendous growth. Since Dare County is one of the oldest counties in the state, there are many historical sites in the county. Some of the significant historical sites in Dare County are shown in Figure 4. These sites played an important role on the existing land uses and place constraints on future land uses of the county.

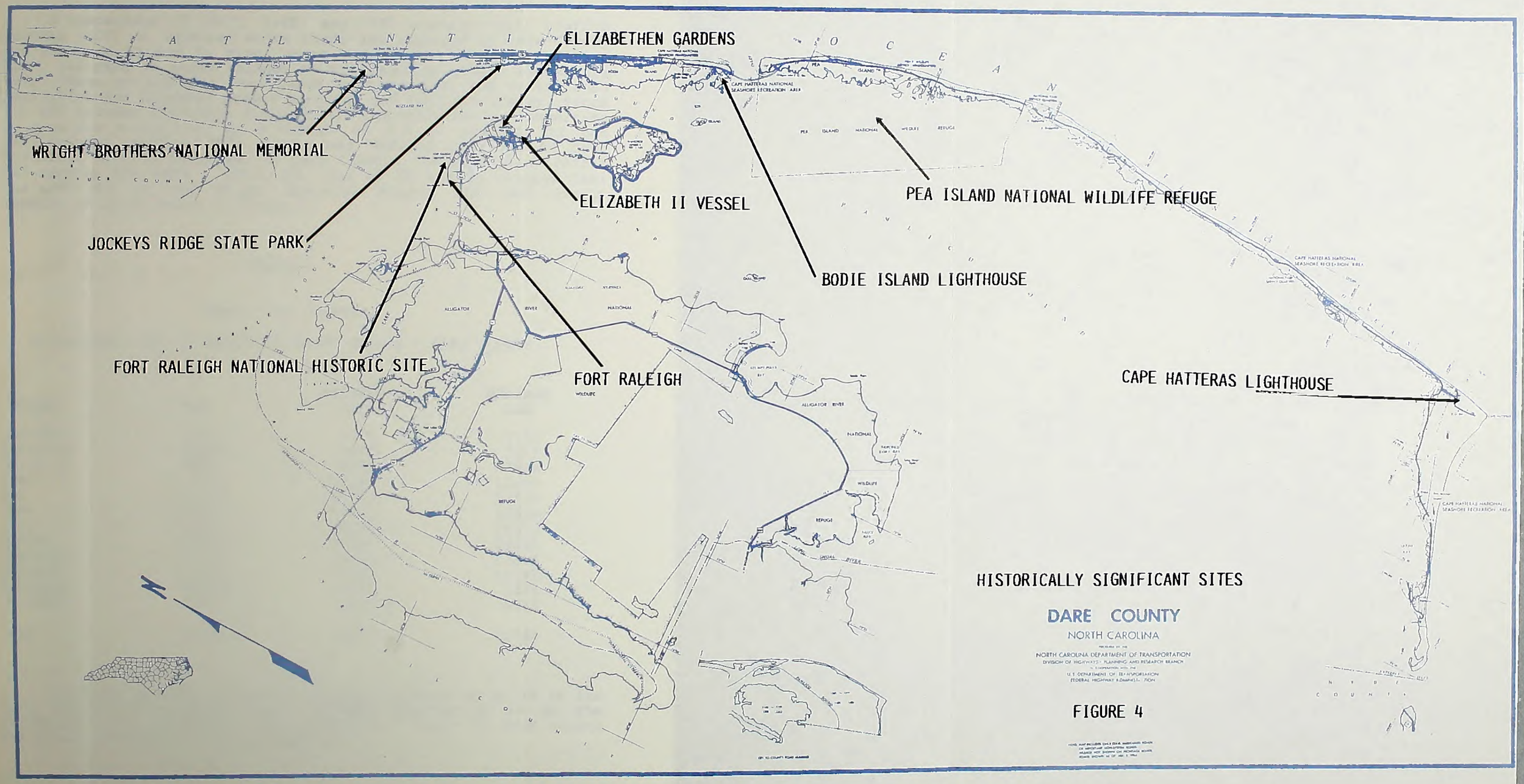

ELIZABETHEN GARDENS
WRIGHT BROTHERS NATIONAL MEMORIAL
ELIZABETH II VESSEL
PEA ISLAND NATIONAL WILDLIFE REFUGE
JOCKEYS RIDGE STATE PARK
BODIE ISLAND LIGHTHOUSE
FORT RALEIGH NATIONAL HISTORIC SITE
FORT RALEIGH
CAPE HATTERAS LIGHTHOUSE
HISTORICALLY SIGNIFICANT SITES
DARE COUNTY
NORTH CAROLINA
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS - PLANNING AND RESEARCH BRANCH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

FIGURE 4

IV. TRAFFIC CONDITIONS IN DARE COUNTY

A comparison of 1977, 1982, and 1987 average daily traffic volumes (ADT) on selected major roads and highways in Dare County are shown on Figure 5. Also, shown are projections for the year 2010, assuming no major changes to the existing street system are made. These projections were based on historical and anticipated population ans economic growth patterns and land use trends. Since the ADT volumes fluctuate daily and on a monthly basis, summertime volumes are multiplied by a factor of 1.5 to account for the recreational traffic. This factor was derived from the 24 hour automatic traffic recorders in Dare County. The automatic traffic recorder at the Dare / Currituck line of US 158 is located near the east end of the Wright Memorial Bridge. The 1987 yearly summary is shown below in Table 3.

TABLE 3

YEARLY ATR SUMMARY

US 158 EAST END OF CURRITUCK SOUND BRIDGE - DARE COUNTY

Month	ADT	Average Sat	Average Sun
January	5301	5578	4332
February	5594	6282	5612
March	6485	8360	7882
April	7936	96557	10150
May	10818	15732	15530
June	10367	16700	16935
July	13053	23295	21510
August	12321	23044	20840
September	10735	16850	13815
October	8722	10995	11792
November	7860	9087	9314
December	6652	6445	5615
Year	9820	12507	11763

Automatic traffic recorders are also located on NC 12 at the north end of the Oregon Inlet Bridge, and on US 64 at the Alligator River (Linsey C. Warren Bridge). Those 24 hour counts are shown in Table 4 & 5 respectively.

TABLE 4

NC 12 NORTH END OF OREGON INLET BRIDGE
DARE COUNTY

Month	ADT	Average Sat	Average Sun
January	1338	1452	1025
Feburary	1457	1660	1685
March	1958	2680	2222
April	2962	3490	3640
May	4465	6222	5830
June	4472	5810	5845
July	6472	8187	7302
August	6501	8087	6915
September	4818	6262	5630
October	4484	6170	5470
November	--	--	--
December	1660	1807	1560
Total	3680	4788	4355

TABLE 5

US 64 ON ALLIGATOR RIVER BRIDGE
TYRRELL - DARE COUNTIES

Month	ADT	Average Sat	Average Sun
January	--	--	--
February	1180	1120	1130
March	1947	2082	2034
April	2508	2652	2680
May	3259	3874	3868
June	3524	4653	4525
July	2950	3955	3760
August	--	--	--
September	--	--	--
October	--	--	--
November	2504	2490	2930
December	--	--	--
Year	2400	3001	2951

Vehicle registration has increased at a much greater rate than population since 1940. The increase can best be shown by a

graph depicting the change in the persons per vehicle ratio over a period of time. This ratio is obtained by dividing the total population of the area by the total number of vehicles registered in that area. Figure 6 shows this comparison for North Carolina and Dare County, and includes projections to 2010. The results illustrate the transition from a non-automobile oriented society to one whose vitality is heavily dependent on the automobile. This change in life style has gradually occurred over many years, with the most dramatic difference being between 1940 and 1960. This is primarily due to the following reasons:

(1) The post-depression increase in the standard of living.

(2) The increase in population including the post World War II "Baby Boom".

(3) The transition from an agriculturally dominated society to a more diversified one (less people on the farm, but more need for transportation).

(4) The availability of automobiles in the 1960's and 1970's and the banking credit to buy them (more cars, easier credit).

Since the early 1970's nevertheless, these reasons for purchasing more automobiles have had less influence and have led to the expectation that the person per vehicle rate will begin to stabilize as projected in Figure 6. This saturation effect is expected to stabilize trip-making characteristics of families in the middle and upper income categories due to the fact they already have the finanncial means to purchase a sufficient number of vehicles to satisfactory serve their transportation needs. On the other hand, moderate growth in the trip making characteristics of lower income families is projected due to an expected improvement in their financial well-being.

The traditional trip-making characteristics does not apply to areas dependent upon seasonal recreational traffic. The 1986 ATR summary in Table 3, 4, & 5 indicates the highest traffic volume months plus average Saturday and Sunday volumes.

DEFICIENCIES IN THE TRANSPORTATION SYSTEM

The deficiencies in the transportation system are due to the geography of the county. Dare County, located in the northeast section of the state, is bounded by the Atlantic Ocean, Pamlico, Croatan, and Albemarle Sounds. With the exception of Hyde County, to the west, access is by way of bridges of ferry to the county land areas.

Admittance to Dare County from the north must occure through Back Bay National Wildlife Refuge in Virginia and the Currituck Outer Banks. This access route is only available to a limited number of full-time Currituck residents, commercial fisherman and emergency vehicles. Access from the south occurred along a private

road which extends north from a guard house near the Currituck / Dare County line to the community of Corolla, midway the Currituck banks until the road was taken over and paved by the Department of Transportation in 1984. This road is now the extension of NC 12 to Corolla.

In 1975, an injunction dissolved by the courts, eliminated beach access to the Currituck banks from the north. Since 1975, a number of developments have occurred. During late 1977, in a bid for preservation of the banks, Nature Conservancy purchased two tracts north of Corolla, extending from Currituck Sound to the ocean. In 1978, the Audubon Society was deeded a major tract with similar charactertics at the southern end of the Currituck banks.

By early 1979, six major subdivisions had been approved on the Currituck banks. The US Fish and Wildlife Service was also, interested in establishing a wildlife refuge on the banks. In 1981, the NC Department of Transportation through consultants did prepare an enviromental impact statement (EIS) to address the impacts of Outer Banks access. Through cooperation with the County Commissioners, condemnation proceedings, cooperation of other property owners, the Outer Banks access road from the Currituck / Dare County line to the community of Corolla was paved and taken over by the NCDOT in 1984.

In conjunction with the paving of the above portion of road, the NC Board of Transportation, on October 12, 1984, went on record in the form of a resolution, opposing the creation of a through road along Currituck Outer Banks north of Corolla. Both Currituck County and the State of North Carolina opposed a direct public access connection along the Currituck banks between Virginia and Dare County, due to development pressure it would create.

The roadway capacity and the US 158 bridge,Wright Memorial Bridge, creates serious doubt as to the feasibility of conducting a safe and efficient evacuation of the Currituck outer banks now and in the future. It is difficult to estimate the time required to excavate everyone on the Currituck outer banks because of many unknown factors including--the number of people in the area at any given time, capacity of the roadway under evacuation conditions, the volume of traffic which would be generated to the south of the Currituck outer banks including the portions of the barrier islands in Dare County, and the potential for a bottleneck forming at the US 158 bridge.

At this report writing NCDOT has hired a consultant engineering firm to prepare a feasibility study of access to the outer banks. This study will consider the following proposals:

1. Widen Wright Memorial Bridge
2. Build a new bridge near the existing Wright Memorial Bridge
3. Build a new bridge from the mainland near Aydlett or another feasible location to Corolla

4. Study the feasibility of a temporary ferry operation from the mainland to Corolla

Results of this study should be available the summer of 1989.

Other deficiencies in the system which are currently under construction or listed in the State Transportation Improvement Program are the Washington Baum Bridge replacement and widening, US 158 widening to five lanes, Colington Road bridges to be replaced, and NC 12 widening in the community of Duck.

CAPACITY, WIDTH AND ALIGNMENT DEFICIENCIES

North Carolina's standard for highway construction calls for eleven foot lanes on all highways with traffic volumes greater than 2000 ADT (average daily traffic) or design speeds greater than 50 miles per hour, including all primary arterials. A minimum lane width of 9 feet can be tolerated on collector roads with an ADT of less than 400 vehicles per day. Minimum level service for minor collector roads dictate a 40 mph design speed during peak traffic conditions.

Design requirements for thoroughfares vary according to the design capacity and level of services to be provided. Universal standards in the design of thoroughfares are not practical. Each road or highway section must be individually analyzed and its design requirements determined on the basis of amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way.

The level of service is a function of the ease of movement experienced by motorists using the facility. The ability of a motorist to drive at a desires speed is dependent upon the physical design of the road, the amount and character of traffic control devices, the influence and character of traffic generated by abutting property, and imposed speed restrictions. The level of service is generally indicated by the overall travel speed experienced by traffic. Recommemded minimum levels of service for roads and highways including in the proposed Dare County Thoroughfare Plan are given in Table 6.

TABLE 6

MINIMUM LEVELS OF SERVICE FOR ROADS AND HIGHWAYS

Facility	Overall Travel Speed During Peak Traffic Conditions
Major and Minor Arterials	50 - 55 MPH
Major Collector Roads	45 - 50 MPH
Minor Collector Roads	40 MPH

From the standpoint of driver convenience, ease of operations, and safety, it would be desirable to widen all existing roads and highways to provide a minimum lane width of 12 feet. However, when considering overall statewide needs and available highway revenues, it is found that these levels of improvement applied statewide would be impractical. It is necessary, therefore, to establish minimum tolerable widths for existing roads with respect to traffic demands which would be economically feasible. Table 7 gives the widths used in determining the existing lane deficiencies in the county.

TABLE 7

MINIMUMN TOLERABLE LANE WIDTHS (in feet)

ADT	Principal Arterials	Minor Arterials	Collectors
Over 2,000	11	11	11
400-2,000	--	10	10
100 - 400	--	10	9
Below 100	--	10	9

An analysis of highways in Dare County was made to determine if the projected traffic (year 2010) would exceed the practical capacity of the system. The projected volumes are shown in Figure 5. Comparing the projected traffic to available capacities, it was anticipated that the following roads will be experiencing capacity related problems within the design period. Some roadways are scheduled to be improved and are listed in the State's Highway Improvement Program. Those sections of roadway will be followed by the TIP number.

1. NC 12 (R-2125) Pea Island National Wildlife Refuge boundary north of Rodanthe - realignment of "S" curves.

2. NC 12 (R-2319) Duck - widen existing roadway thru Duck to three lanes.

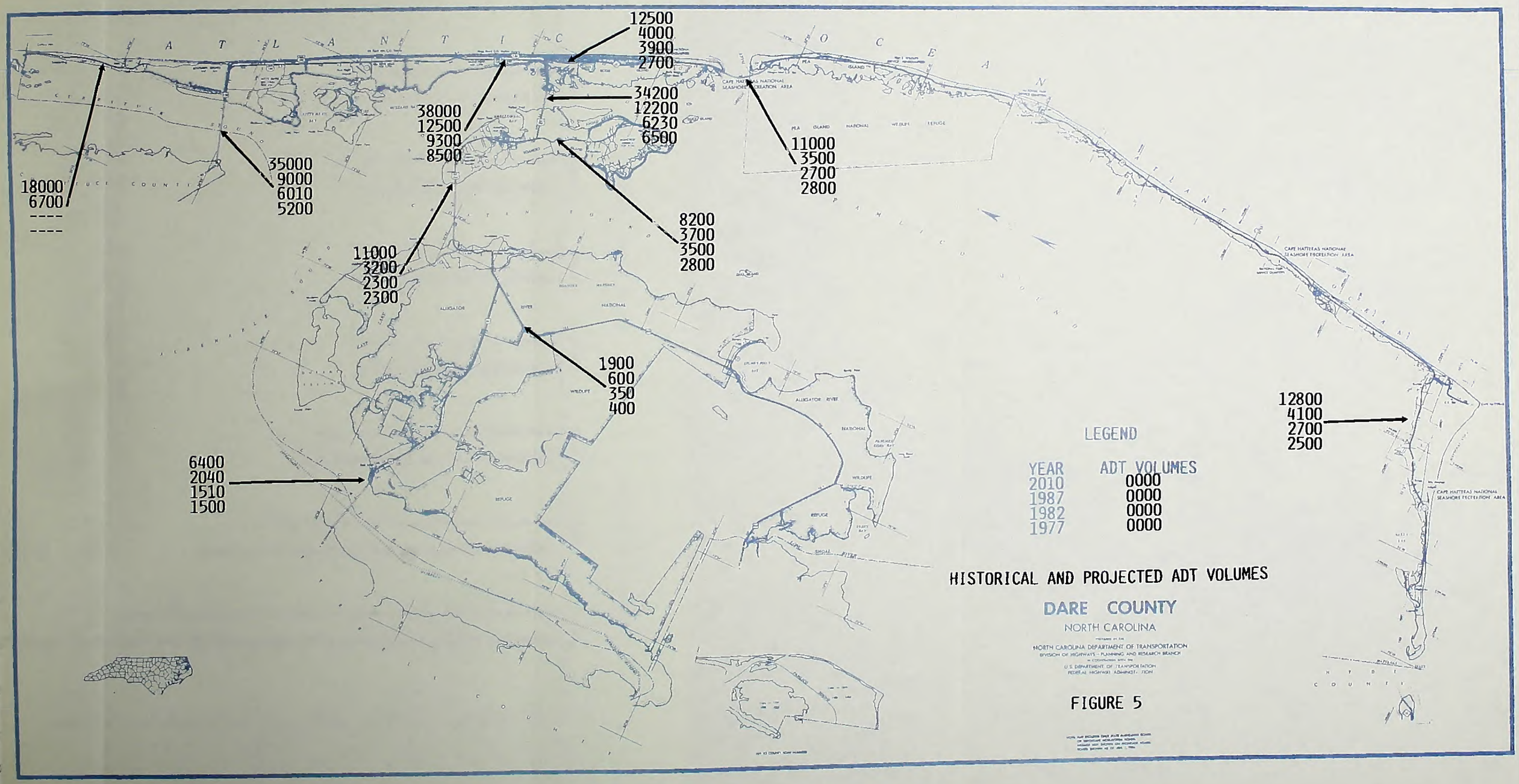
3. US 158 (R-2227) NC 12 at Southern Shores to Whalebone - widen existing roadway to five lanes.

4. US 64-264 (R-2305) US 345 to US 158 at Whalebone excluding bridges - construct bridge approaches.

5. NC 12 (B-2090) Rehabilitation of bridge over Oregon Inlet.

6. US 64-264 (B-2023) Replacement of the Washington Baum Bridge.

7. US 64-264 (B-2301) Replacement of the Daniels Bridge.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2700
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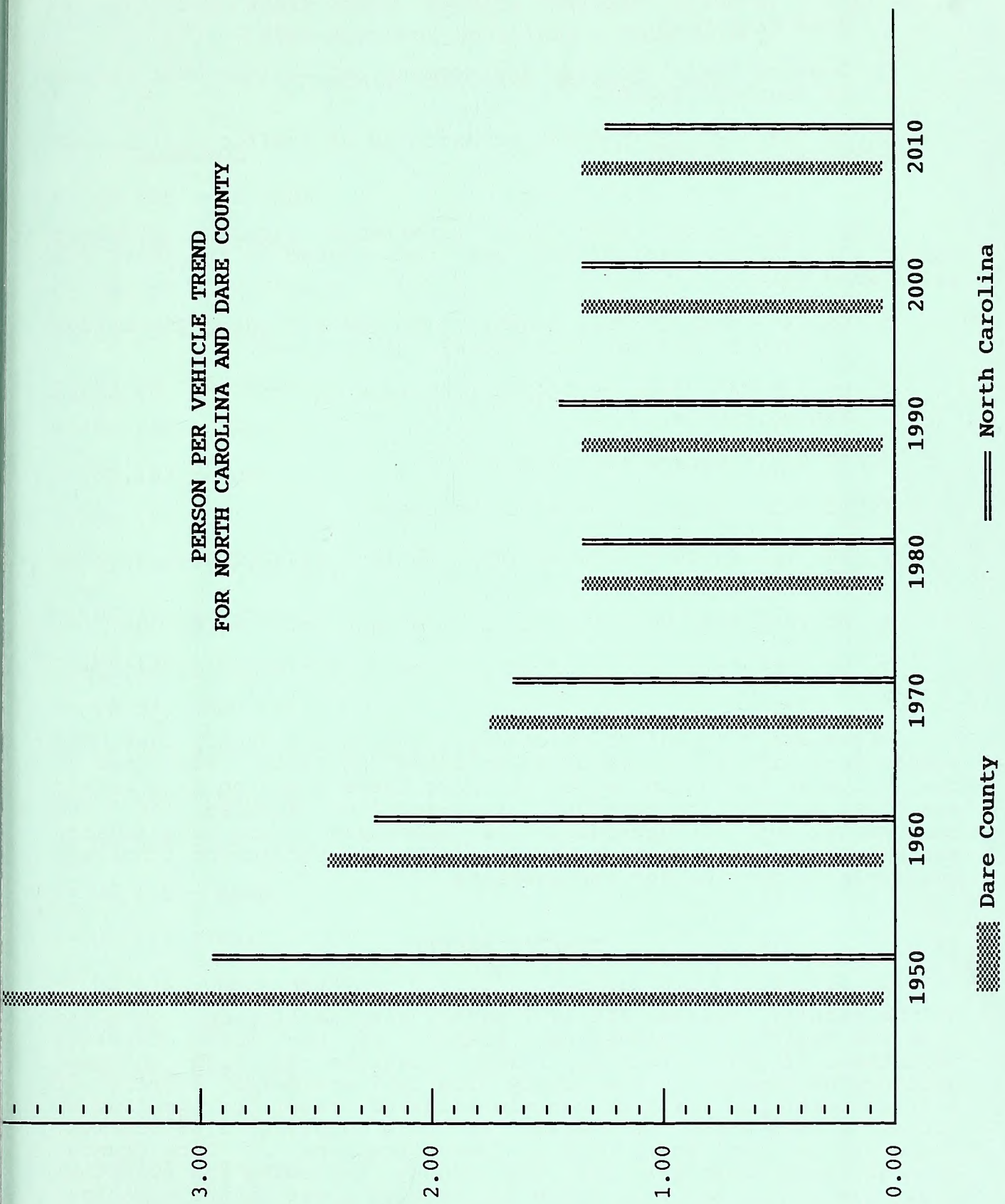
LEGEND
YEAR ADT VOLUMES
2010 0000
1987 0000
1982 0000
1977 0000
HISTORICAL AND PROJECTED ADT VOLUMES
DARE COUNTY
NORTH CAROLINA
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS - PLANNING AND RESEARCH BRANCH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

FIGURE 5

FIGURE 6


PERSON PER VEHICLE TREND
FOR NORTH CAROLINA AND DARE COUNTY
3.00
2.00
1.00
0.00
1950
1960
1970
1980
1990
2000
2010
Dare County
North Carolina

8. SR 1217 (B-2024) Replace bridges over creek and bay on Colington Road.

9. Dogwood Trail (B-2087) Replacement of bridge over lagoon in Southern Shores.

10. US 158 / NC 12 (L-2318) Landscaping of traffic islands at Whalebone.

Other facilities that will experience capacity problems during our planning period that are not listed in the State TIP are listed below:

1. US 64 - from Tyrrell County to US 264 including the bridge (Linsey C. Warren) over the Alligator River.

2. US 264/64 - from US 264/64 intersection to the proposed Manteo Bypass.

3. US 264 - Bypass around Manteo

4. NC 345 - from US 264/64 to Wanchese.

5. NC 12 South - from US 158 / NC 12 S intersection to Cape Hatteras.

6. NC 12 - from US 158 / NC 12 to Wright Memorial Bridge.

7. US 158 - from US 158 / NC 12 N to Wright Memorial Bridge.

There are a number of secondary roads in the county that have substandard widths. Standards established in Table 7 were used in the analysis. The width needed to bring these roads up to standard are given as the recommended cross-section. Because of the substantial cost of upgrading all secondary roads to standard, narrow widths may have to be tolerated until sufficient funds are available to provide for improvements.

TRAFFIC SAFETY

Traffic accidents are of assistance in locating problem areas on the highway system. The 1897 safety program listing, obtained from the Traffic Engineering Branch of the North Carolina Department of Transportation, lists locations of high accident sections of roadway in the county. The 1985 statewide average of 2.36 accident per million vehicle miles of travel for two-lane NC routes is well above the average in Dare County of 1.86 acc/mvm. There are no significant high accident locations in Dare County. High accident locations for the county including the municipal areas are listed below in Table 8. Problem areas in the municipal jurisdictions will not be discussed in this county report but will be analyzed and discussed in the urbanized transportation report and study now underway.

TABLE 8

High Accident Locations - Dare County

January 1984 thru December 1987

Location	Number of Accidents
-- US 158 - SR 1206	9
-- US 158 - Eckner	9
-- US 158 - Driftwood	9
-- US 64 - Agona	9
-- US 64 - Fernando	9
-- US 158 - Baker	10
-- US 158 - Eden	10
-- US 158 - First	10
-- US 158 - Ocean Bay	10
-- US 158 - Clark	11
-- US 158 - Colington	11
-- US 64 - Manteo	11
-- US 264 - Sir Walter Raleigh	11
-- US 158 - Danube	11
-- US 158 - SR 1217	11
-- US 158 - Baum	12
-- US 158 - Mall	12
-- US 158 - Nags Head	14
-- US 64 - NC 345	14
-- US 158 - Eighth	15
-- US 158B - US 158	17
-- US 158 - Third	26
-- US 158 - Kill Devil Hills	34
-- US 158 - Ocean Acres	39

BRIDGE CONDITIONS

Bridges are a vital and unique element of a highway system. First, they represent the highest unit investment of all elements of the system. Second, any inadequacy or deficiency in a bridge reduces the value of the total investment. Third, a bridge presents the greatest chance of all potential highway failures for disruption of community welfare. Finally, and most importantly, a bridge presents the greatest opportunity of all highway failures for loss of life. For these reasons, it is imperative that bridges be constructed to the same design standards as the system of which they are a part.

Congress enacted the National Inspection Program Standards on April 27, 1971, implementing the Federal Highway Act of 1968. These standards require that "all structures defined as bridges located on any of the Federal-Aid Highway Systems be inspected and the safe load carrying capacity computed at regular intervals, not to exceed two years." A sufficiency index number has been calculated for each bridge for the purpose of establishing eligibility and priority for replacement. The bridges with the highest priority are replaced as Federal-Aid funds and State funds are made available. Additional funds have recently been provided by Congress specifically for bridge replacement.

The North Carolina DOT's Bridge Maintenance Unit has been assisted by consultants in inspecting all bridges on the State Highway System. All bridges in Dare County have been analyzed, rated, appraised, inventoried, and the resulting data has been reduced to a more readily useable form as a management tool.

A sufficiency rating was used in the analysis to determine the deficiency of a particular bridge. The sufficiency rating is a method of evaluating factors which are indicative of bridge sufficiency to remain in service. Factors include: structural adequacy and safety, service ability and functional obsolescene, essentially for public use, type structure, and traffic safety features. The result of this method is a percentage in which 100 percent would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient of deficient bridge. A sufficient rating of 50 percent of less qualifies for Federal Bridge Replacement funds.

Table 9 shows functionally obsolete bridges with sufficiency rating of 60 percent and less. Refer to Figure 7 for map location of these bridges.

NO.	KEY	ROUTE
P2	C-5	US 64
3	D-7	US 264
4	A-2	US 158
5	A-3	SR 1217
6	A-3	SR 1217
7	B-4	US 64
8	E-2	NC 12
9	B-4	US 64
10	D-7	US 264
11	A-6	NC 12
12	A-5	US 64
13	C-6	US 264
14	A-5	US 64
15	C-6	US 264
16	C-6	US 264
38	B-12	SR 1216
39	F-18	SR 1141
40	A-11	SR 1208
41	E-11	SR 1164
42	B-15	SR 1123
43	B-16	SR 1190
F44	F-2	NC 12
F45	F-2	NC 12
17	A-2	DOGWOOD TRAIL
18	A-2	DOGWOOD TRAIL

TABLE 9

Structurally Deficient or Functionally Obsolete

Bridges in Dare County

Map Index	Sufficiency Rating %	Life	Location
6	027.4	4	SR 1217 @ Creek
10	034.5	8	US 264 @ Pains Creek
5	036.1	6	SR 1217 @ *creek
45	040.4	10	NC 12 @ Hatteras Island Ferry Ramp
12	040.6	5	US 64 @ Roanoke Sound
41	041.2	7	SR 1164 @ Canal
44	041.4	8	NC 12 @ Hatteras Island Ferry Ramp
3	044.0	11	US 264 @ Deep Creek
16	044.2	10	US 264 @ Canal
40	044.5	4	SR 1208 @ Canal
15	048.7	10	US 264 @ Canal
14	048.9	10	US 264 @ Roanoke Sound / Minor Channel
9	056.4	20	US 64 @ Croatan Sound
17	052.3	12	Dogwood Trail @ Creek
18	026.4	3	Dogwood Trail @ Creek
11	046.9	2	Herbert C. Bonner Bridge
7	053.2	6	Lindsey C. Warren Bridge
16	047.9	10	US 158 (Wright Memorial)
56	28.2	5	US 264 (Hyde County)

V. RECOMMENDATIONS

THE PROPOSED THOROUGHFARE PLAN

The recommended throughfare plan resulting from the study and analysis is shown in Figure 8. A brief discussion of the road's deficiencies and function is included to support its classification as a thoroughfare. More detail on physical and operational characteristics is given in Appendix A, Table 1.

Principal Arterials

US 64 and US 64/264 serves as the major traffic carrier for through and local travel. Because of the strip develop-ment through much of Manteo, it must handle a high percentage of turning traffic which detracts fron the capacity of the road and increases accident potential. Fortunately, some of the roadway has a center turn lane which keeps the two outside lanes open to travel most of the time. Widening from NC 345 east is already scheduled for 1988 in the North Carolina Transportation Program, 1987 - 1995. If the proposed US 64/264 Bypass is built no other major improvements of US 64/264 should be necessary.

US 64/264 Bypass is recommended to separate travel by function and to avoid the expensive and disruption of widening US 64/264. A two lane road on 110 feet of right of way is proposed to allow for an ultimate four lane divided cross section (see Appendix A, Table 1). A benefits analysis was performed to see if driver savings justified construction of this project and a net benefit per mile of $18,600,000 resulted during a twenty year design period.

Minor Arterials

US 158 from Currituck sound to the intersection of US 158 / NC 12. This facility serves through and local traffic between Dare and Currituck County and is also the primary route from Norfolk, Virginia into Currituck and Dare Counties. Seasonal recreational traffic is very demanding on this facility. The recommended improvement is to four lane Wright Memorial Bridge and to five lane the remaining section to NC 12. The highway feasibility study mentioned in Chapter IV, now underway, will help to determine the feasibility of widening the existing bridge or going to another location.

US 264 from Hyde County to US 64, serves as the only inland southern arterial route for the county. Traffic volumes do not justify major widening.

Collector Road System

The rural collector routes serve primarily intra-county travel. The major collector roads supplement the arterial system by providing an inter connecting network between smaller population centers and the arterial system. The minor collector roads collect traffic from the local roads and carry it to a higher system facility. Major collector roads of Dare County are as follows:

NC 345 provides access in the study area between Wanchese and US 64/264. This is the only access for the unioncorporated community of Wanchese. Traffic volumes do not justify major widening, but widening to a standard 12 foot cross-section with possible 4 foot shoulders for pedestrians and bicycles.

NC 12 north from US 158 serves the outerbank communities of Southern Shores, Duck, and Sanderling. This facility also serves the outer banks communities of Currituck County to Corolla since it is the only available route north of US 158. To accommodate future travel and to improve the traffic flow, three lanes with paved shoulders for pedestrians and bicycles is the recommended improvement. The center lane would be used for a left turn lane.

NC 12 south from US 158 to Hatteras serves as an arterial for local and recreational traffic for the southern section of Dare County. Future traffic demands more than a two lane facility but difficulties of high tides during turbulent weather and the narrow strip of land may dictate only improvements to the existing facility. Three laning of certain sections of highway with the center lane for passing would improve the capacity of this highway. Oregon Inlet bridge is being improved for safety at the present time, but future traffic volumes call for four laning of this structure.

Ferry Operations

Hatteras Inlet ferry crossing from Hatteras Island to Ocracoke Island. In 1986, this ferry operation system served 240,064, with 1995 projected vehicles of 294,600, an increase of 22.7 percent.

FIGURE 8

RECOMMENDED THOROUGHFARE PLAN

LEGEND

PRINCIPAL ARTERIALS	EXISTING	PROPOSED
INTERSTATE		
OTHER		
MINOR ARTERIALS		
MINOR COLLECTORS		

DARE COUNTY

NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS—PLANNING AND RESEARCH BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALE

VI. IMPROVEMENT PRIORITIES

An evaluation of the North Carolina highway program from administrative, historical, and financial perspectives indicates the following objectives are of greatest importance:

To improve the North Carolina arterial system to reduce travel costs and improve travel service between urban areas.

To improve the level of service and safety of all roads and highways on the State system in a cost effective manner.

To encourage economic growth.

To preserve the natural and human environment.

To allocate funds to projects in a fair and equitable way.

(1) User benefits, (2) cost, (3) probability that a project will stimulate economic development, (4) quantification of environmental impacts, and (5) relationship of a project to the State arterial system provide a basis for evaluating projects as to how well they meet the objectives.

User benefits include cost savings resulting from an improvement project through reduction in vehicle operating costs, travel time costs, and accident costs. The estimated through travel served by a project provides a measure of the importance of a project to the State arterial system. Heavier volumes of through traffic are generally found on the more important facilities.

Estimation of environmental impacts of a project is one of the more difficult evaluations. Environmental factors usually considered in highway project evaluation can be divided into three major categories - physical, social, and/or cultural, and economic environmental considerations (Table 8). Many of these are accounted for when a project is evaluated with respect to user benefits, cost, and economic development potential. However, thirteen environmental factors are generally not considered in these evaluations. They are the environmental impacts of a project on (1) air quality, (2) water resources, (3) soils and geology, (4) wildlife, (5) vegetation, (6) neighborhoods, (7) noise, (8) educational facilities, (9) churches, (10) park and recreational facilities, (11) historical sites and landmarks, (12) public health and safety, and (13) aesthetics. The summation of both positive and negitive impact probabilities with respect to these factors provides a measure of the relative environmental impact of a project.

TABLE 10

Environmental Considerations

Physical Environment	Social and/or Cultural Environment	Economic Environment
Air quality	Housing	Businesses
Water Resources	Neighborhoods	Employment
Soils and Geology	Noise	Economic
Wildlife	Education Facilities	Development Public
Vegetation	Churches	Utilities Transportation
	Park & Recreational Facilities	Costs Capital Costs
	Public Health and Safety	Operation and Maintenance Costs
	National Defense	
	Aesthetics	

The evaluation of the proposed Dare County projects with respect to user benefits, estimated costs, probability that economic development will be stimulated, environmental impact, and through travel services is given in Table 11.

Primary and Secondary Highway System

Recommended priorities for construction and the estimated costs (in 1988 dollars) are shown in Table 12. The recommended priorities are based on needs, anticipated future traffic volumes, and the technical data developed in this report. These projects are not necessarily listed in order of probable need.

Since conditions are constantly changing with time, these priorities should be reevaluated periodically by the District and Division Engineer.

Other desirable improvements are the upgrading of the County's unpaved and narrow collectors. Although adequate from a capacity standpoint, the poor operational characteristics of these facilities will make improvements desirable to enhance their safety and functional design.

TABLE 11

Benefits Evaluation of Dare County Projects

Project Description	User Benefits ($1000)	Cost ($1000)	Economic Development Potential Probability	Environmental Impact Probability	2005 Through Traffic ADT
1.US 64/264 Bypass	18,600	C 2,775 R 600	.55	+.20 -.35	10,000
2.US 64	225,000	C24,000	.60	+.40 -.35	4,000
3.Wright Memorial Bridge	30,000	C20,000	.62	+.25 -.25	20,000
4.New Bridge Mainland to Outerbanks	1,792,716	C65,000	.55	+.10 -.15	8,000
5.NC 12 North to Hatteras	129,016	C10,500 R 5,500	.60	+.35 -.20	0
6.NC 12 South to Hatteras	120,000	C15,000 R 5,000	.59	+.45 -.20	4,000
7.NC 345	5,000	C 2,500	.55	+.20 -.25	0
8.US 158 Wright Memorial Bridge to NC 12	30,000	C 2,000 R 4,000	.50	+.35 -.25	20,000

TABLE 12

Improvements and Cost Estimates

Route & Section	Recommended Cross-Section	Cost Estimates Const.	R.O.W.	Total
1.US 64/264 Bypass	2 lane section (build on 4 lane section)	2,775	600	3,375
2.US 64, Tyrrell Co. to Manteo	4 lane divided	13,000	-	24,000
3.Wright Memorial Bridge	4 lane section	43,000	-	43,000
4.New Bridge, Mainland to Outerbanks	4 lane section	65,000	-	65,000
5.NC 12 North, US 158 to Currituck	3 lane section (center-turn lane)	10,500	5,500	16,000
6.NC 12 South, US 158 to Hatteras	3 lane section (center-turn lane)	15,000	5,000	20,000
7.NC 345, US 64/264 to Wanchese	2 lane section (paved shoulders)	2,500	-	2,500
8.US 158	5 lane section (center-turn lane)	2,000	2,000	4,000

VII. IMPLEMENTATION

There are several tools which are available for use by a county to assist in the implementation of a Thoroughfare Plan. They are as follows:

State-County Adoption of Thoroughfare Plan

If requested, the Department of Transportation, in cooperation with a county, will cooperatively develop and mutually approve a County Thoroughfare Plan. The mutually approved plan would serve as a guide to the Department of Transportation in the development of the road and highway system of the County. The approval of the plan by the County will enable standard road regulations and land use controls to be used effectively to assist in the implementation of the plan.

Subdivision Controls

The subdivision regulations require every subdivider to submit to the county planning commission a plan of the proposed subdivision and requires that the subdivision be constructed to certain standards. Through this process, it is possible to require the subdivision streets to conform to the thoroughfare plan and to reserve or protect necessary rights-of-way for projected roads and highways that are to become a part of the thoroughfare plan. The construction of subdivision streets to adequate standards would reduce maintenance costs and will facilitate the transfer of the streets to the State Highway System. Appendix B outlines the recommended design standards.

Land Use Controls

Land use regulations are an important tool in that they regulate future land development and minimize undesirable development along roads and highways. The land use regulatory system can improve highway safety by requiring sufficient building setbacks to provide for adequate sight distances and by requiring off-street parking.

Funding

The majority of the improvements are scheduled and funded by the Transportation Improvement Program. The Board of Transportation regularly conducts public meetings to obtain input from the public of their needs for highway improvements.

However, not all roadway improvements are covered by this procedure. Nearly all secondary road work is done on a county by county basis. These funds (county construction account) are used to pave unimproved roads, widen roadways, stabilize dirt roads, make minor alignment improvements, and even construct short connectors when appropriate. The county commissioners are encouraged to work with the Division Engineer when the county's priority list is developed. Many of the minor improvements recommended may be realized by using the county's construction account funds and cooperatively developing the county's priority list with the Division Engineer.

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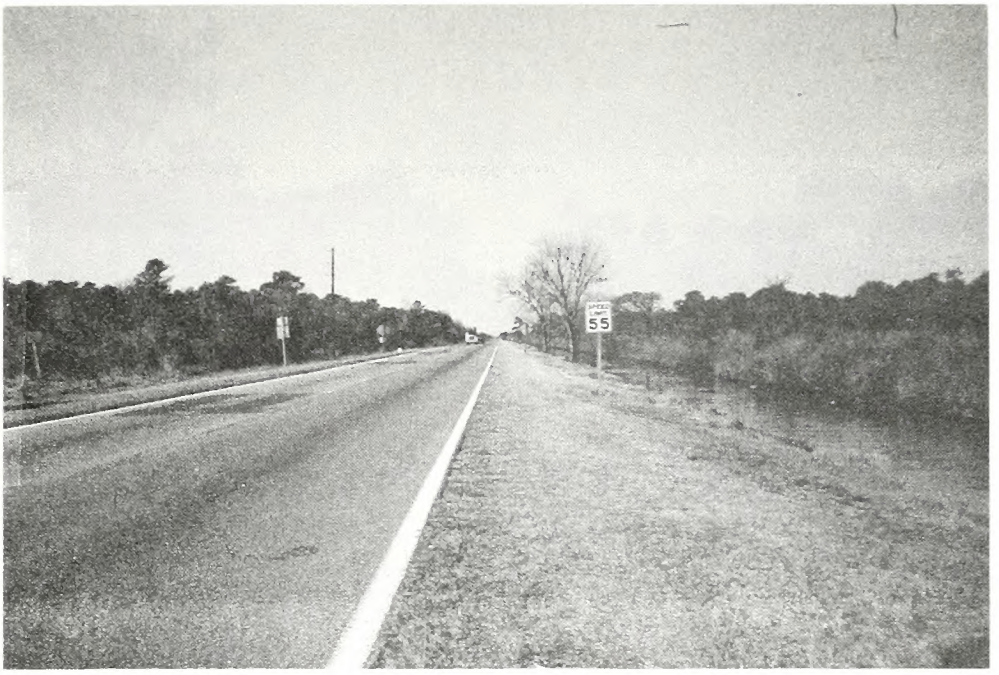
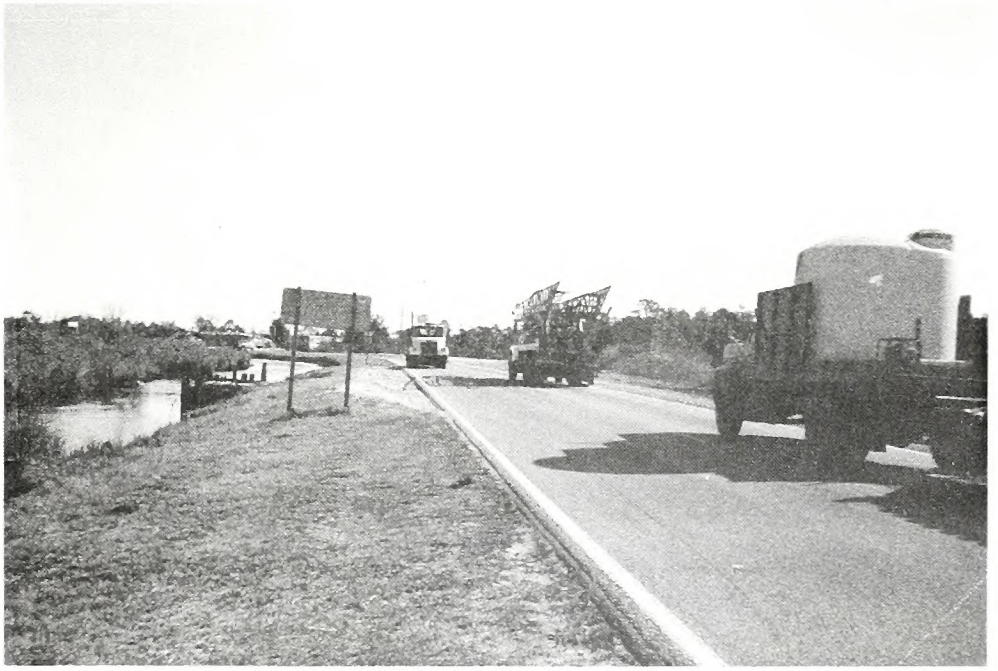
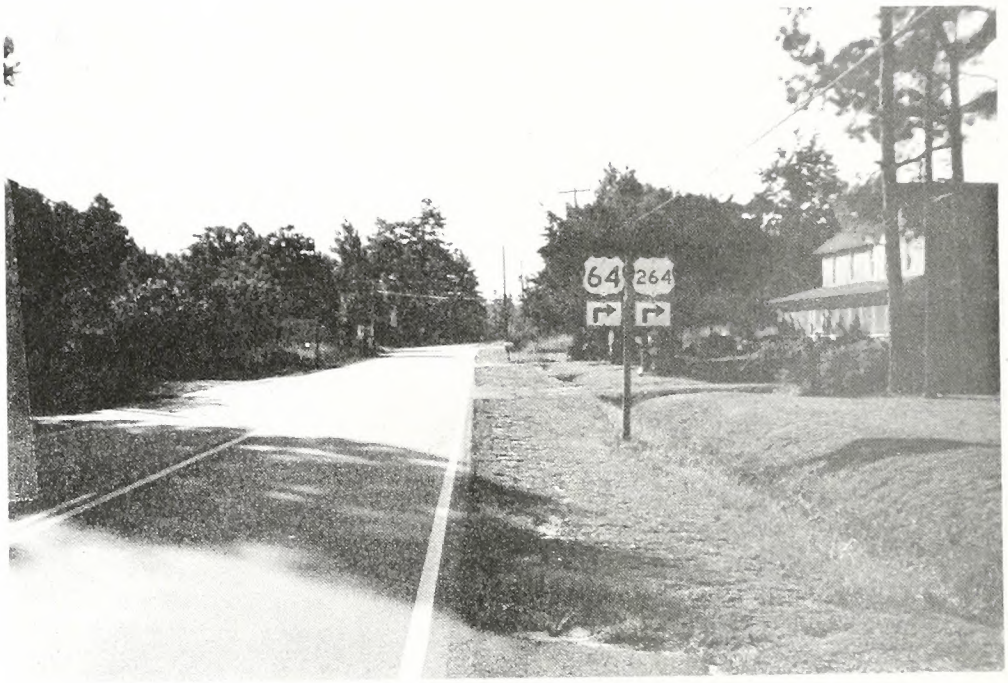


US 64



US 64-264



US 64-264 NEAR MANNS HARBOR

NC 345 TO WANCHESE

HERBERT C. BONNER BRIDGE

WILLIAM B. UMSTEAD BRIGE

NC 12 AT DUCK

NC 12 AT SANDERLNG

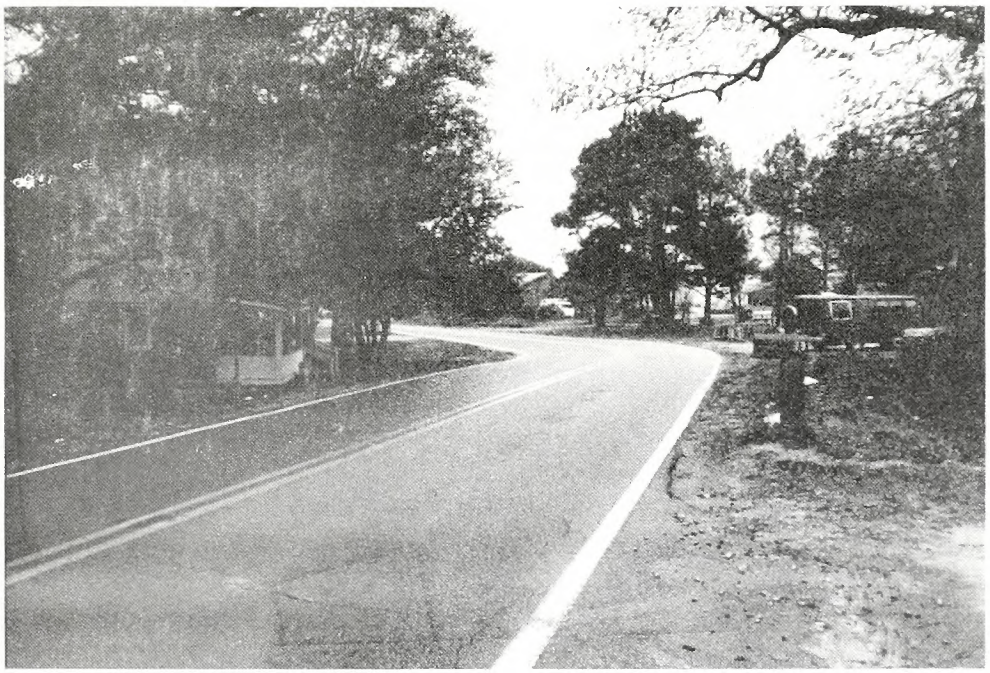
SR 1217 TO COLINGTON

BRIDGE ON SR 1217

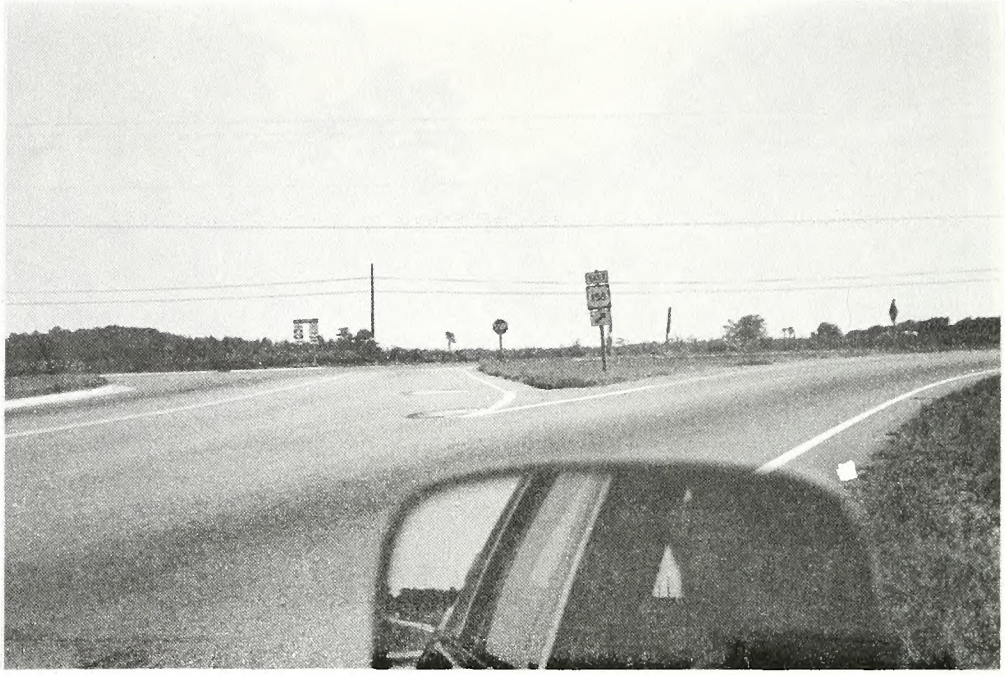
SR 1217

SR 1217

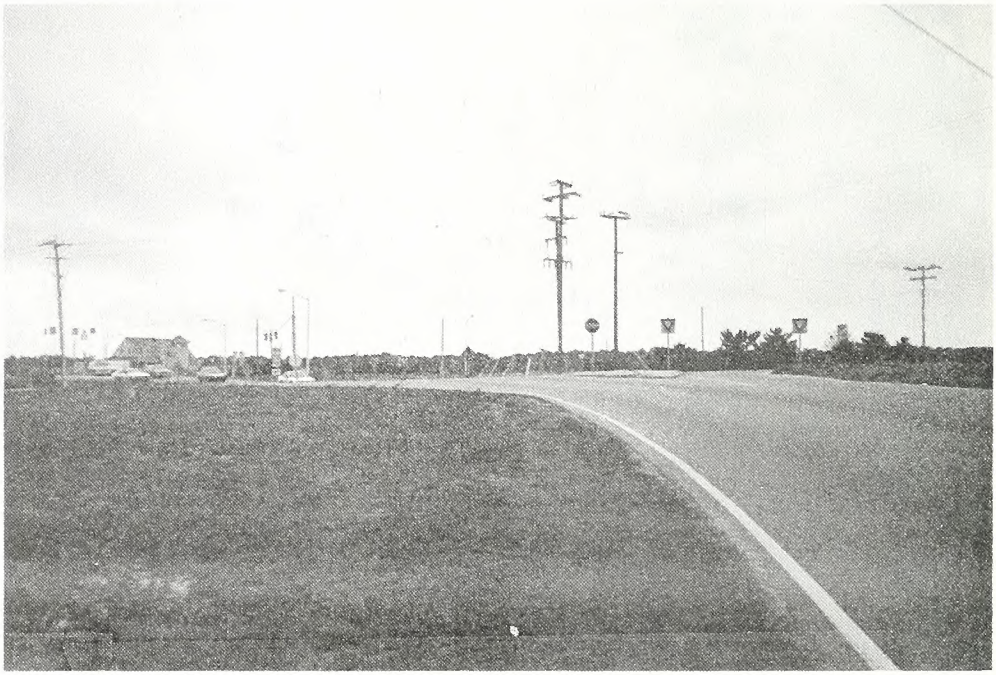
SR 1217



SR 1217



US 158 / NC 12 INTERSECTION



US 158 / NC 12 INTERSECTION

APPENDICES

APPENDIX A

Typical Cross Sections

Typical cross sections recommended by the Thoroughfare Planning Unit are shown in Appendix A, Figure 1, and listed in Appendix A, Table 1.

Cross section "A" is illustrative for controlled access freeways. The 46 foot grassed median is the least desirable median width but there could be some variation from this depending upon design considerations. Slopes of 8:1 into 3 foot drainage ditches are desirable for traffic safety. Right-of-way requirements would typically vary upward from 250 feet depending upon cut and fill requirements.

Cross section "B" is typical for four lane divided highways in rural areas which may have only partial or no control of access. The minimum median width for this cross section is 30 feet, but a wider median is desirable. Design requirements for slopes and drainage would be similar to cross section "A", but there may be some variation from this depending upon right-of-way constraints.

Cross section "C", seven lane urban, and cross section "D", five lane urban, are typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

Cross sections "E" and "F" are used on major thoroughfares where left turns and intersecting streets are not as frequent. Left turns would be restricted to a few selected intersections.

Cross section "G" is recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 feet is recommended with 30 feet being desirable.

Typical cross section "H" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections.

Thoroughfares which are proposed to function as one-way traffic carriers would typically require cross section "I". Cross section "J" and "K" are usually recommended for minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "J" would be

used on those minor thoroughfares where parking on both sides is needed as a result of more concentrated development.

Cross section "L" is used in rural areas or for staged construction of a wider multilane cross section. On some thoroughfares projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time.

The curb and gutter urban cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk further away from the street to provide added separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

Rights- of-way shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require wither additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

If there is sufficient bicycle traffic along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to allow for the bicycle facilities. The North Carolina Bicycle Facility and Program Handbook should be consulted for design standards for bicycle facilities.

Recommended typical cross sections for thoroughfares were derived on the basis of projected traffic, existing capacities, desirable levels of service and available right-of-way.

APPENDIX A TABLE 1

THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATION FOR DARE APPENDIX

FACILITY & SECTION	EXISTING X - SECTION DIST*RDWY*ROW MI * FT * FT			CAPACITY CURRENT (FUTURE)	1987 ADTS	2010 ADTS	RECOMMENDED X - SECTION RDWY * ROW (ULT)*(ULT)	
US 64								
Tyrrell Co.- MP0170	1.70	26	250	6200	1700	6500	B	ADQ
MP0170 - MP0552	3.82	24	250	6200	1700	6500	B	200
MP0552 - MP0603	.51	24	270	6200	1700	6500	B	ADQ
MP0603 - MP0684	.81	24	80	6200	1700	6500	B	200
MP0684 - MP0771	.86	24	270	6200	1700	7200	B	ADQ
MP0771 - MP0886	1.15	24	80	6200	1700	7200	B	200
MP0886 - MP1020	1.34	24	270	6200	1900	8000	B	ADQ
MP1020 - US 264	3.16	24	80	6200	1900	8000	B	200
US 64/264								
US 264 - MP1726	3.90	22	60	10000	2300	10000	ADQ	ADQ
MP1726 - MP2006	2.80	22	200	10000	2300	10000	ADQ	ADQ
MP2006 - NCL MANTEO	3.32	44	100	12000	3200	12000	ADQ	ADQ
NCL MANTEO - SR 1131	.72	44	60	12000	10000	12000	ADQ	ADQ
SR 1131 -SCL MANTEO	.76	44	100	12000	10000	12000	(H)	ADQ
SCL MANTEO - NC 345	.56	24	100	10000	11600	10000	(H)	ADQ
NC 345 - BAUM BRIDGE	1.34	22	60	(45000)	12000	36000	D	100
BAUM BRIDGE - MP2842	1.70	20	60	(45000)	12200	36000	D	100
MP2842 - US 158	.70	20	250	(45000)	12500	36000	D	ADQ
US 158 - NC 12	.17	20	60	(45000)	12500	36000	D	100
US 264								
HYDE COUNTY - US 64	25.4	18	60	5000	600	2400	ADQ	ADQ
US 158								
W.BDRY WRIGHT MEM BDG - KITTY HAWK CL	1.30	24	---	10000	12300	35000	H	N/A
KITTY HAWK CL - NC 12	1.50	24	80	10000	12300	35000	D	ADQ
NC 12 NORTH								
US 158 - CURRITUCK CO	9.96	20	60	8000	8500	18000	I	80
NC 12 SOUTH								
MP0532 - MP2246	17.1	24	60	10000	3600	12000	I	80
MP2246 - MP2282	.36	20	60	8000	3600	10000	I	80
MP2282 - MP2789	5.07	22	60	8000	3500	10000	I	80
MP2789 - MP3945	11.6	24	60	10000	3200	10000	I	80
MP3945 - MP4283	3.38	22	100	8000	2600	10000	I	ADQ
MP4283 - MP4667	3.84	24	60	10000	2600	10000	I	80
MP4667 - MP5498	8.31	22	60	8000	3500	10000	I	80
MP5498 - MP5658	1.60	24	60	10000	3500	10000	I	80
MP5658 - MP5883	2.25	22	60	8000	3700	11000	I	80

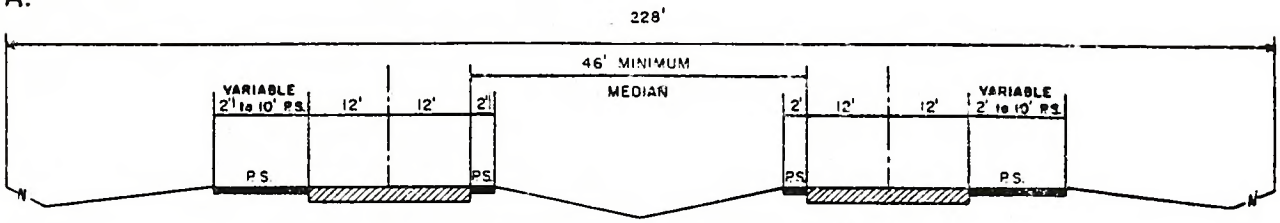
APPENDIX A TABLE 1

THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATION
FOR DARE APPENDIX

FACILITY & SECTION	EXISTING X - SECTION DIST* MI	RDWY* FT	ROW * FT	CAPACITY CURRENT (FUTURE)	1987 ADTS	2010 ADTS	RECOMMENDED X - SECTION RDWY (ULT)	ROW * (ULT)
MP5883 - MP5893	.10	24	60	10000	3700	12000	I	80
MP5893 - MP5937	.44	54	60	-----	3700			ADQ
NC 345								
US 64/264 - SR 1141	4.87	18	60	5000	3700	8000	H	70
US 64/264 BYPASS								
US 64/264 - SR 1128	2.00	--	--	(12000)	----	12000	L(B)	110
SR 1128 - NC 345	1.60	--	--	(12000)	----	15000	L(B)	110

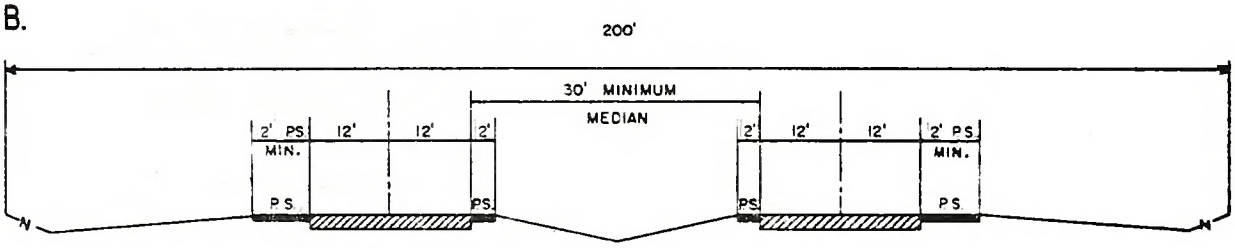
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



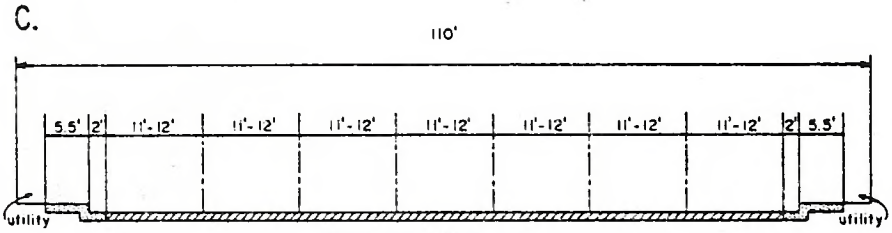
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



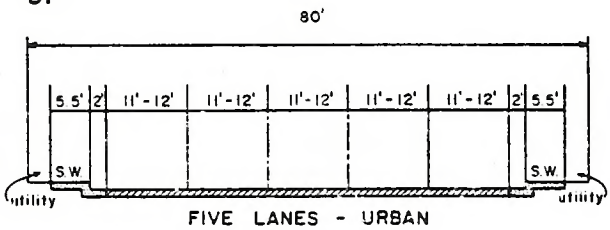
FOUR LANES DIVIDED WITH MEDIAN - RURAL

C.



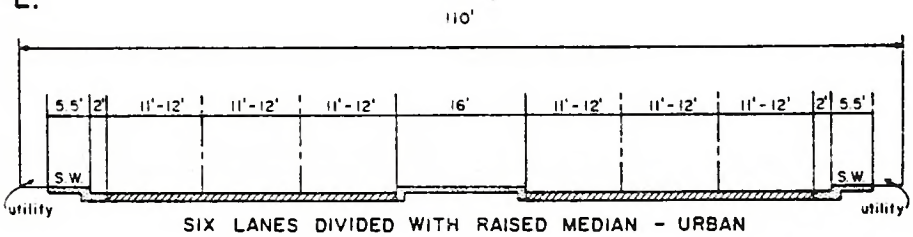
SEVEN LANES - URBAN

D.



FIVE LANES - URBAN

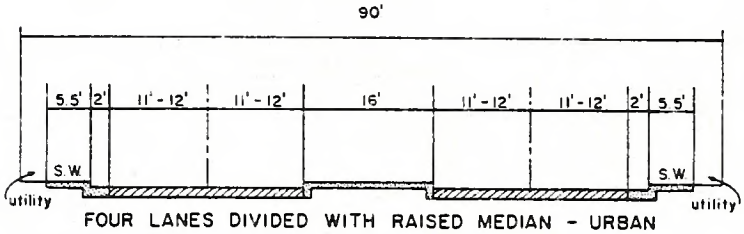
E.



SIX LANES DIVIDED WITH RAISED MEDIAN - URBAN

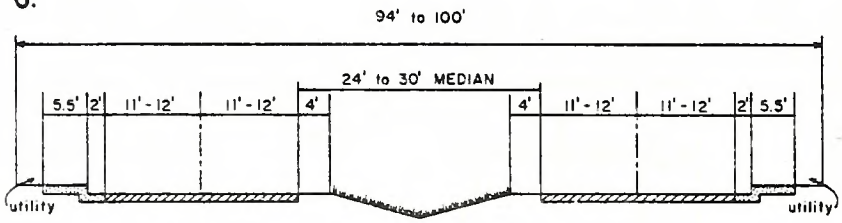
TYPICAL THOROUGHFARE CROSS SECTIONS
(CONTINUED)

F.



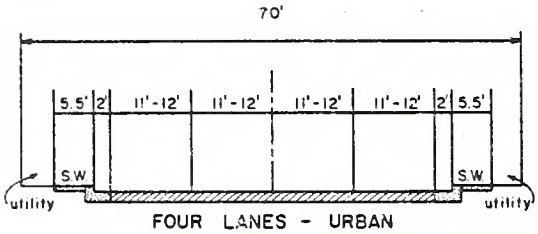
FOUR LANES DIVIDED WITH RAISED MEDIAN - URBAN

G.



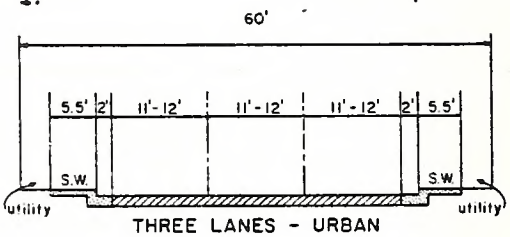
FOUR LANES DIVIDED - URBAN BOULEVARD
GRASS MEDIAN

H.



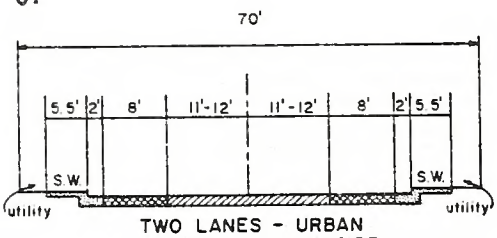
FOUR LANES - URBAN

I.



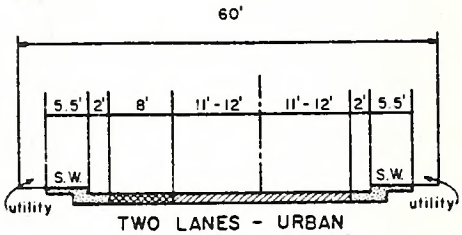
THREE LANES - URBAN

J.



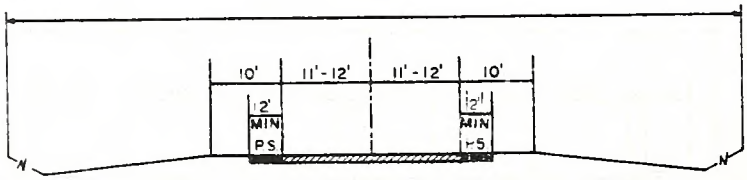
TWO LANES - URBAN
PARKING ON EACH SIDE

K.



TWO LANES - URBAN
PARKING ON ONE SIDE

L.



TWO LANES - RURAL

APPENDIX B

RECOMMENDED DEFINITIONS AND DESIGN STANDARDS
FOR SUBDIVISION ORDINANCES

DEFINITIONS:

I. Streets and Roads:

A. Rural Roads

1. Principal Arterial - A rural link in a network of continuous routes serving corridor movements having trip length and travel density attributes indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of interstate routes and other routes designated as principal arterials.

2. Minor Arterial - A rural link in a network joining cities and larger towns and providing intrastate and intercounty service at relatively high overall travel speeds with minimum interference to through movement.

3. Major Collector - A road which serves major intracounty travel corridors and traffic generators and provides access to the Arterial system.

4. Minor Collector - A road which provides service to small local communities and links the locally important traffic generators with their rural hinterland.

5. Local Road - A local road that serves primarily to provide access to adjacent land and for travel over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of interstate, other freeway, expressway, or parkway links, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

2. Minor Thoroughfares - Minor thoroughfares are important streets in the city system and perform the function of collecting traffic from the local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating a minor through traffic movement and may also serve abutting property.

3. Local Streets - A local street is any link not on a higher-order urban system and serves primarily to provide direct access to abutting land and access to higher systems.

C. Specific Type Rural or Urban Streets

1. Freeway, expressway, or parkway - Divided multi-lane roadways designed to carry large volumes of traffic at relatively high speeds. A freeway is a divided highway providing for continuous flow of vehicles with no direct access to abutting property or streets and with access to selected crossroads provided via connecting ramps. An expressway is a divided highway with full or partial control of access and generally with grade separations at major intersections. A parkway is a highway for noncommercial traffic, with full or partial control of access, and usually located within a park or a ribbon of parklike development.

2. Residential Collector Street - A local access street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

3. Local Residential Street - Cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than one mile in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

4. Cul-de-sac - A short street having but one end open to traffic and the other end being permanently terminated and a vehicular turn around provided.

5. Frontage Road - A local street or road that is parallel to a full or partial access controlled facility and functions to provide access to adjacent land.

6. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

A. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.

B. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

C. Lot - A portion of a subdivision, or any other parcel of land, intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

1. Corner Lot - A lot abutting upon two streets at their intersection.

2. Double-Frontage Lot - A continuous (through) lot which is accessible from both of the parallel streets upon which it fronts.

3. Reverse-Frontage Lot - A continuous (through) lot which is accessible from only one of the parallel streets upon which it fronts.

III. Subdivision

A. Subdivider - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

B. Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, whether immediate or future, of sale or building development, and all divisions of land involving the dedication of a new street or a change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or recombination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein;
(2) the division of land into parcels greater than five acres where no street right-of-way dedication is involved; (3) the public acquisition by purchase of strips of land for the widening or opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than two acres into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

C. Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. Since a transfer of property is involved, the dedication is made by written instrument and is completed with an acceptance.

D. Reservation - A reservation of land does not involve any transfer of property rights. It simply constitutes an obligation to keep property free from development for a stated period of time.

Design Standards

I. Streets and Roads:

The design of all streets and roads within Elizabeth City shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway and Transportation Officials (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the requirements of the thoroughfare plan for Elizabeth City as adopted by the local bodies and the North Carolina Department of Transportation.

The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

The urban planning area shall consist of that area within the urban planning boundary as depicted on the mutually adopted Elizabeth City Thoroughfare Plan. The rural planning area shall be that area outside the urban planning boundary.

A. Right-of-way Widths: Right-of-way widths shall not be less than the following and shall apply except in those cases where right-of-way requirements have been specifically set out in the Thoroughfare Plan.

		Min. Right-of-way, Ft.
1.	Rural	
	a. Principal Arterial	
	Freeways	350
	Other	200
	b. Minor Arterial	100
	c. Major Collector	100
	d. Minor Collector	100
	e. Local Road	*60

		Min. Right-of-way, Ft.
2.	Urban	
	a. Major Thoroughfare Other than Freeway and Expressway	90
	b. Minor Thoroughfare	70
	c. Local Street	*60
	d. Cul-de-sac	**Variable

The subdivider will only be required to dedicate a maximum of 100 feet of right-of-way. In cases where over 100 feet of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 100 feet. In all cases in which right-of-way is sought for an access

controlled facility, the subdivider will only be required to make a reservation.

A partial width right-of-way, not less than sixty (60) feet in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is subdivided, the remainder of the full required right-of-way shall be dedicated.

B. Street Widths: Widths for street and road classifications other than local shall be as required by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. Local Residential
   Curb and gutter section - 26 feet, to face of curb
   Shoulder section - 20 feet to edge of pavement , 4 foot shoulders
2. Residential Collector
   Curb and gutter section - 34 feet, face to face of curb
   Shoulder section - 20 feet to edge of pavement, 6 foot shoulders

---

*The desirable minimum right-of-way is established as 60 feet. If curb and gutter is provided, 50 feet of right-of-way if adequate.

**The right-of-way dimension will depend on radius used for vehicular turn-around. Distance from edge of pavement of turn around to right-of-way should not be less than the distance from edge of pavement to right-of-way on street approaching turn-around.

C. Geometric Characteristics: The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-way shall apply.

1. Design Speed

The design speeds for subdivisions type streets shall be:

	Desirable	Minimum		
Rural		Level	Rolling	Mountainous
Minor Collector Roads	60	50	40	30
Local Roads including Residential Collectors and Local Residential	50	50	40	30
Urban				
Major Thoroughfares other than Freeway or Expressway	60	50	50	50
Minor Thoroughfares	60	50	40	40
Local Streets	40	40	30	20

2. Maximum and Minimum Grades

a. The maximum grades in percent shall be:

Design Speed	Level	Rolling	Mountainous
60	3	4	6
50	4	5	7
40	5	6	8
30		9	10
20			12

b. A minimum grade for curbed streets normally should not be less than 0.5%, a grade of 0.35% may be allowed where there is a high type pavement accurately crowned and in areas where special drainage conditions may control.

c. Grades for 100 feet each way from intersections should not exceed 5%

d. For streets and roads with projected annual average daily traffic less than 250, short grades less than 500 feet long may be 150% greater.

3. Minimum Sight Distances

In the interest of public safety, no less than the minimum sight distance applicable shall be provided in every instance. Vertical curves that connect each change in grade shall be provided and calculated using the following parameters. (General practice call for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case):

Design Speed, MPH	20	30	40	50	60
Stopping Sight Distance -					
Min. Distance, Ft.	150	200	275	350	475
Desirable Distance Ft.	150	200	300	450	650
Min. K* Value For:					
Minimum Crest Curve	16	28	55	85	160
Des. Crest Curve	16	28	65	145	300
Minimum Sag Curve	24	35	55	75	105
Des. Sag Curve	24	35	60	100	155
Passing Sight Distance -					
Minimum Passing Distance, Feet (2 lane)		1100	1500	1800	2100
Minimum K* Value for Crest Vertical Curve		365	686	985	1340

Sight distance provided for stopped vehicles at intersections should be in accordance with A Policy On Geometric Design of Highways and Streets (AASHTO).

4. The following table shows the maximum degree of curve and related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06 with 0.04 desirable.

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* K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet of the vertical curve which will provide minimum sight distance.

Design Speed MPH	Max. e*	Minimum Radius Feet	Maximum Degree of Curve Degrees
20	.04	125	45.0
30	.04	300	19.0
40	.04	560	10.0
50	.04	925	6.0
60	.04	1410	4.0
20	.06	115	50.0
30	.06	275	21.0
40	.06	510	11.5
50	.06	830	7.0
60	.06	1260	4.5
20	.08	110	53.5
30	.08	250	23.0
40	.08	460	12.5
50	.08	760	7.5
60	.08	1140	5.0

* e = rate of roadway superelevation, foot per foot

D. Intersections

1. Streets shall be laid out so as to intersect as nearly as possible to right angles, and no street should intersect any other at an angle of less than sixty degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Off-set intersections are to be avoided unless exception is granted by the Division of Highways

for intersections involving the State Highway System, or the Planning Board for intersections involving only the municipal street system. Intersections which cannot be aligned should be separated by a minimum length of 200 feet between surveyed centerlines.

E. Cul-de-sacs

Cul-de-sacs, unless exception is granted by the local planning board, shall not be more than five hundred feed in length. The distance from the edge of pavement on the vehicular turn-around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn-around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

F Alleys

1. Alleys should be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provision is made for service access.

Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least twenty feet.

3. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn-around facilities at the dead-end as may be approved by the Planning Board.

4. Sharp changes in alignment and grade shall be avoided.

G. Permits For Connection To State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the nearest District Engineer of the Division of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of thirty feet from the edge of pavement. On streets with curb and gutter, utility poles should be set back a minimum distance of six feet from the face of curb.

I Wheel Chair Ramps

In accordance with Chapter 136, Article 2A, ss136-44.14, all street curbs in North Carolina being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason after September 1, 1973, shall provide wheelchair ramps for the physically handicapped at all intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Wheelchair ramps and depressed curbs shall be constructed in accordance with details contained in the Department of Transportation, Division of Highways, Publication entitled, "Guidelines, Curb Cuts and Ramps for Handicapped Persons".

J. Horizontal Width on Bridge Decks

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

a. Shoulder Section Approach

i. Under 800 ADT During Design Year

Minimum 28 feet width face to face of parapets of rails or pavement width plus 10 feet, whichever is greater.

ii. 800-2000 ADT Design Year

Minimum 34 feet width face to face of parapets or tails or pavement width plus 12 feet, whichever is greater.

iii. Over 2000 ADT Design Year

Minimum 40 feet. Desirable 44 feet width face to face of parapets or rails

b. Curbs and Gutter Approach

i. Under 800 ADT Design Year

Minimum 24 feet face to face of curbs.

ii. Over 800 ADT Design Year

Width of approach pavement measured face to face of curbs. Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be 1'6" minimum, or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having four or more lanes undivided two-way traffic should be as follows:

a. Shoulder Section Approach - Width of approach pavement plus width of usable shoulders on the approach left and right.
Minimum 8'
Desirable 10'

b. Curb and Gutter Approach - Width of approach pavement measured face to face of curbs.

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